WHAT IS CLAIMED IS:

1. An apparatus for inspecting a semiconductor wafer, said apparatus comprising:

(a) a first light source for producing a first beam of light, said first beam of light illuminating an area on the semiconductor wafer,

(b) a main imaging camera disposed above the semiconductor wafer for detecting light scattered from the area illuminated by the first beam of light, and

(c) a main imaging lens for imaging the area on the semiconductor wafer illuminated by the first beam of light onto said main imaging camera, and

(d) an auto-focus system to compensate for vertical deviations in the topology of said semiconductor wafer, said auto-focus system ensuring that said main imaging lens images the area on said semiconductor wafer onto said main imaging lens in focus, said auto-focus system comprising,

(i) a second light source with associated optics for producing a second beam of light, said second beam of light reflecting off the area on the semiconductor wafer, and

(ii) a sensor with associated optics for detecting light reflected from the semiconductor wafer by the second beam of light.

2. The apparatus as claimed in claim 1 wherein said sensor is a linear position sensor.

3. The apparatus as claimed in claim 2 wherein said auto-focus system further comprises circuitry for converting the light detected by said linear position sensor into a voltage which is proportional to the relative vertical position of the area of the semiconductor wafer.

4. The apparatus as claimed in claim 3 further comprising a chuck plate which is adapted to retain the semiconductor wafer.

5. The apparatus as claimed in claim 4 further comprising a stage for displacing said chuck plate.

6. The apparatus as claimed in claim 5 wherein said stage is adapted to displace said chuck plate towards and away from said main imaging lens.

7. The apparatus as claimed in claim 6 wherein said stage is adapted to displace said chuck plate in three dimensions.

8. The apparatus as claimed in claim 6 wherein said second light source produces a second beam of light which is collimated with fixed horizontal and vertical beam widths.

9. The apparatus as claimed in claim 8 wherein said auto-focus system additionally comprises:

(a) a first lens positioned between said second light source and the semiconductor wafer, said first lens focusing the second beam of light along its vertical axis,

(b) a second lens positioned between the semiconductor wafer and said sensor, said second lens focusing the second beam of light along its vertical axis, and

(c) a third lens positioned between the semiconductor wafer and said sensor, said third lens focusing the second beam of light along its horizontal axis.

10. The apparatus as claimed in claim 3 wherein said sensor is reversed-biased to produce first and second currents in response to detecting light reflected from the semiconductor wafer by the second beam of light.

11. The apparatus as claimed in claim 10 wherein said circuitry comprises:

(a) a first trans-impedance amplifier for converting the first current into a proportional first voltage,

(b) a second trans-impedance amplifier for converting the second current into a proportional second voltage,

(c) a differential amplifier connected to said first and second trans-impedance amplifiers, said differential amplifier producing a differential voltage equal to the difference between the first voltage and the second voltage,

(d) a summing amplifier connected to said first and second trans-impedance amplifiers, said summing amplifier producing a summing voltage equal to the sum of the first voltage and the second voltage, and

(e) an analog divider connected to said differential and summing amplifiers, said analog divider generating a divider voltage which is proportional to the quotient of the differential voltage and the summing voltage.

12. The apparatus as claimed in claim 11 wherein the divider voltage is directly proportional to the vertical position of the illuminated area of said semiconductor wafer.

13. The apparatus as claimed in claim 12 further comprising a computer connected to said circuitry, said computer being adapted to regulate the relative position of said semiconductor wafer based on the value of the divider voltage.

14. A method for inspecting an area of a semiconductor wafer using a wafer inspection apparatus, said wafer inspection apparatus comprising a first light source for producing a first beam of light, said first beam of light illuminating an area on the semiconductor wafer, a main imaging camera disposed above the semiconductor wafer for detecting light scattered from the area illuminated by the first beam of light, and a main imaging lens for imaging the area on the semiconductor wafer illuminated by the first beam of light onto said main imaging camera, and an auto-focus system comprising a second light source for producing a second beam of light, said second beam of light reflecting off the area on the semiconductor wafer, and a sensor for detecting light reflected from the semiconductor wafer by the second beam of light, said method comprising the steps of:

(a) examining the vertical position of the illuminated area of said semiconductor wafer using said auto-focus system, said auto-focus system yielding an output voltage in response thereto, and

(b) displacing the relative vertical position of the illuminated area of said semiconductor wafer using said output voltage.

15. A method for inspecting an area of a first semiconductor wafer using a wafer inspection apparatus, said wafer inspection apparatus comprising a first light source for producing a first beam of light, said first beam of light illuminating an area on the first semiconductor wafer, a main imaging camera disposed above the first semiconductor wafer for detecting light scattered from the area illuminated by the first beam of light, and a main imaging lens for imaging the area on the first semiconductor wafer illuminated by the first beam of light onto said main imaging camera, and an auto-focus system comprising a second light source for producing a second beam of light, said second beam of light reflecting off the area on the first semiconductor wafer, and a

sensor for detecting light reflected from the first semiconductor wafer by the second beam of light, said method comprising the steps of:

(a) providing a second semiconductor wafer,

(b) examining the second wafer using said auto-focus system so as to yield a surface contour map for said second wafer, and

(c) examining the first semiconductor wafer using said wafer inspection apparatus, wherein the position of the first patterned semiconductor wafer is displaced relative to said imaging lens based upon the surface contour map for said second wafer.

16. An auto-focus system for an object, such as a semiconductor wafer, said auto-focus system comprising,

(a) a light source for producing a beam of light, said beam of light reflecting off the area on the object,

(b) a linear position sensor for detecting light reflected from the area of the object by the beam of light, and

(c) circuitry for converting the light detected by said linear position sensor into a voltage which is proportional to the relative vertical position of the area of the object.